THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF PSYCHOLOGY

THE RELATIONSHIP BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND THE DEVELOPMENT OF SUBSTANCE USE

KAYLEEN BOECKENHAUER
SPRING 2020

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Nursing
with honors in Psychology

Reviewed and approved* by the following:

Charisse Nixon
Professor of Psychology
Thesis Supervisor

Carolynn Masters
Associate Professor of Nursing
Honors Adviser

* Electronic approvals are on file.

ABSTRACT

Adverse childhood experiences (ACEs) are a set of related traumatic and negative events experienced prior to 18 years of age that may include abuse, neglect, or household dysfunction. ACEs have been shown to have a negative impact on development and are associated with substance use later in life (Brett et al., 2018; Brown & Shillington, 2017; Chandler et al., 2018; Choi et al., 2017; Forster et al., 2018; Shin et al., 2018; Kim et al., 2019; Stein et al., 2017; Lovallo et al., 2018; Wu et al., 2010). A better understanding of the relationship between ACEs and substance use could help guide the current screening and care of individuals who have experienced ACEs and who are, as a result, at risk for developing substance use. The purpose of this systematic review was to better understand the relationship between ACEs and substance use. The systematic review includes three focus areas: studies that discussed types of ACEs (e.g. physical abuse, witnessing domestic violence, neglect) and their relationship to substance use, studies that discussed cumulative ACEs (total number experienced) and the relationship to substance use, and studies that discussed the role of nonmodifiable (e.g. race, gender) and modifiable variables (e.g. resilience, social support) in the relationship between ACEs and substance use. A systematic review was conducted using PubMed, PsycINFO, and CINAHL databases. Adverse childhood experiences OR childhood trauma OR traumatic childhood events AND substance use disorder OR adult substance abuse OR adult substance use, Adverse childhood experiences OR childhood trauma OR traumatic childhood events AND modifiable variables OR nonmodifiable variables OR protective factors OR risk factors were search terms used to identify relevant articles. Four articles were also added after looking through references lists of previously selected articles. Inclusion criteria were that the articles were written in English, published after 2010, and discussed a relationship between adverse childhood

experiences and substance use or discussed variables that can affect the relationship between ACEs and negative outcomes. Articles were excluded during the abstract screen if they were duplicates of previously selected articles, they did not mention substance use as a negative outcome of adverse childhood experiences, or did not include a factor that can affect the relationship between ACEs and negative outcomes. A total of twenty articles were included.

Findings for specific ACEs and the risk for substance use were mixed. Physical abuse, sexual abuse, witnessing domestic violence, and experiencing others' substance use or mental illness in the household were the individual ACEs most consistently reported to be positively associated with substance use (Choi et al., 2017; Forster et al., 2018; Fuller-Thomson et al., 2016; Hughes et al., 2019). Cumulative ACEs were associated with a graded risk of substance use such that higher incidence of ACEs were associated with greater incidence of substance use (Brett et al., 2018; Brown & Shillington, 2017; Chandler et al., 2018; Choi et al., 2017; Forster et al., 2018; Shin et al., 2018; Kim et al., 2019; Stein et al., 2017; Lovallo et al., 2018; Wu et al., 2010). ACEs cause physiological changes in the body that leave a person more vulnerable to substance use (Oshri et al., 2018; Lovallo et al., 2018; Fuller-Thomson et al., 2016; Mergler et al., 2018; Wu et al., 2010; Jääskeläinen et al., 2016; Kim et al., 2019). Variables such as social support, adaptive coping strategies, growth mindset, mindfulness, and resilience can reduce the effect of ACEs on negative outcomes (Moses & Villodas, 2017; Brown & Shillington, 2017; Hughes et al., 2019; Burnette et al., 2017; Sheffler et al., 2019; Claro et al., 2016; Brett et al., 2018; Chandler et al., 2018).

Nurses and other healthcare professionals should be aware that ACEs are associated with negative outcomes such as substance use. Early screening, trauma-informed care, and

interventions to increase social support, positive coping strategies, growth mindset, mindfulness, and resilience can help to lessen the negative impact of ACEs and improve future outcomes.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

I would like to begin by thanking my thesis supervisor, Dr. Charisse Nixon, and my honors advisor, Dr. Carolynn Masters, for their expertise and guidance throughout this process. Dr. Nixon had provided invaluable feedback and instruction as I worked my way through writing my thesis. She has supported my goal of becoming a Schreyer's Scholar from the very beginning and I could not be more pleased that she has been the one to witness the culmination of that goal. If not for Dr. Masters, I would not have been able to be a Schreyer's Scholar as she is the one who advocated for nursing students from the Penn State Behrend campus to be able to participate in the program. She has paved the way for me and my fellow nursing students to enhance their academic involvement and experience the joys and frustration of research.

I would like to thank Penn State Behrend's Nursing faculty, Psychology faculty, and Honors faculty for their support as well. They have been nothing but encouraging, knowledgeable, and motiving during my time as a student and have played a large part in my success in the Schreyer's Honors Program.

Lastly, I thank my family and friends for their patience and love. My belief in myself comes from your belief in me, thank you for always being there.

Chapter 1

Introduction

"Substance use issues" or "substance use", as referred to in this systematic review, can be defined as the use or dependence on illegal drugs such as cannabis, cocaine, amphetamine, inhalants, sedatives, hallucinogens, or opioids (Stein et al. 2017; Kiburi et al., 2018; Choi et al., 2017; Wu et al., 2010). It can also refer to binge/heavy drinking or tobacco use (Chandler et al., 2018). Substance use is a problem globally, nationally, as well as on an individual level. Substance use issues have a global impact as 12.6% of deaths worldwide are attributable to alcohol, tobacco, and other illicit drugs (Kiburi et al., 2018). In the United States, 25 million people currently report using illicit drugs and 65 million report recent misuse of alcohol (Forster et al., 2018). According to the National Institute on Drug Abuse (2017b), tobacco, alcohol, and illicit drugs abuse costs the U.S. more than $740 billion each year related to crime, loss of work productivity, and health care. On an individual level, substance use has been linked to changes in a person's appetite, wakefulness, heart rate, blood pressure, and mood. After just one instance of substance use, events like heart attack, stroke, psychosis, overdose, and death can occur (National Institute on Drug Abuse, 2017a). Long-term effects of substance use can include lung disease, cancer, mental illness, Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, and hepatitis (NIDA, 2017a). This systematic review looked at adverse childhood experiences in relation to the development of substance use and factors that affect the relationship.

The adverse childhood experience (ACE) study was conducted by the Centers for Disease Control and Prevention and Kaiser Permanente from 1995 to 1997. ACEs are a set of related traumatic and negative events experienced prior to 18 years of age. Examples of ACEs include potentially traumatic exposures to physical, emotional, verbal, or sexual abuse, neglect, domestic/intimate partner violence, parental death/abandonment, incarceration of household adults, or household adults with mental health problems or substance use issues (Chandler et al., 2018; Forster et al., 2018). Data from the original study demonstrated that ACEs were correlated with compromised health in adulthood (Centers for Disease Control and Prevention, 2019). ACEs have been shown to lead to a wide range of detrimental and long-lasting health consequences (Forster et al., 2018).

According to Forster et al. (2018), individuals who have experienced ACEs are more vulnerable to the development of substance use. This is because ACEs can trigger changes in brain functioning and physiology which create a predisposition to maladaptive coping behaviors (Forster et al., 2018). Increased impulsivity, a change in the physiological response to cortisol, and poor mental health are physiological changes discussed by this systematic review that can predispose a person to substance use (Oshri et al., 2018; Lovallo et al., 2018; Fuller-Thomson et al., 2016; Mergler et al., 2018; Wu et al., 2010; Jääskeläinen et al., 2016; Kim et al., 2019). Since the original ACE study, more research has been conducted that shows a graded, positive relationship between family-based ACEs and household dysfunction and substance use in adulthood (Forster et al., 2018).

In the United States, individuals of childbearing age (18 to 26 years and older) reported higher instances of substance use according to data gathered by the National Survey on Drug Use and Health in 2017 to 2018. The data showed there was an increase in the number of people aged

18 to 26 years and older who reported using marijuana in the past month and cocaine in the past year when compared to data gathered in 2008 to 2009. These data are concerning considering there is evidence to suggest that parents who use substances put their children at risk for exposure to ACEs, and ACEs have been linked to the development of substance use issues (Halpern et al., 2018; Smith & Wilson, 2016; Merritt et al., 2013). In sum, children who experience ACEs are more likely to use substances and, if they go on to have children of their own, those children are more likely to experiences ACEs and develop substance use issues in adulthood creating an inter-generational effect (Hughes et al., 2019).

The factors that play a role in the correlation between adverse childhood experiences and substance use are still being discovered by researchers. Variables that influence the relationship can be separated into two categories: nonmodifiable vs. modifiable. Nonmodifiable variables cannot be changed and these may include gender, age, ethnicity, etc. Variables that are modifiable can be changed or influenced in some way. Examples may include educational level, physical health, and behavior. Nonmodifiable variables identified in the articles included in this review are gender, age, race, socioeconomic status, and family history of mental illness or substance use (Choi et al., 2017; Fuller-Thomson et al., 2016; Mergler et al., 2018; Shin et al., 2018; Oshri et al., 2018; Wu et al., 2010; Brett et al., 2018; Kim et al., 2018; Hughes et al., 2019; Forster et al., 2018; Jääskeläinen et al., 2016; Kiburi et al., 2018). Modifiable variables that were identified in the literature include social support, coping strategies, growth mindset, mindfulness, and resilience (Moses & Villodas, 2017; Brown & Shillington, 2017; Hughes et al., 2019; Burnette et al., 2017; Sheffler et al., 2019; Claro et al., 2016; Brett et al., 2018; Chandler et al., 2018).

Problem, Purpose, and Research Questions

Substance use is a pervasive problem in today's society. The effects of substance use are obvious when looking at the outcomes on an individual level (e.g., NIDA, 2017a; Choi et al., 2017), but it is truly everyone's responsibility to find a solution when it is viewed at a wider angle and the societal effect is taken into consideration. Millions of dollars are spent each year in healthcare treatment of substance use issues, and children of parents who use substances are more likely to use substances themselves creating an inter-generational effect (NIDA, 2017a; Halpern et al., 2018; Smith & Wilson, 2016). ACEs have been a concern recently as they have been linked to poor health outcomes, including substance use issues (Foster et al., 2018). The purpose of this systematic review of the literature was to compile information currently available regarding the relationship between ACEs and substance use and to discuss variables that affect the relationship. The questions this systematic review looked to answer were 'How are ACEs and substance use correlated?', and 'What variables affect the relationship between ACEs and substance use?"

Chapter 2

Methods

The purpose of this systematic review was to examine the current literature regarding the relationship between childhood adverse experiences and substance use in adulthood and to discuss variables in the relationship. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were utilized in this systematic review (Moher et al., 2009). A literature review was conducted in December 2019 using PubMed, PsycINFO, and CINAHL databases. *Adverse childhood experiences, childhood trauma, traumatic childhood events AND substance use disorder, adult substance abuse, adult substance use, modifiable variables, nonmodifiable variables, protective factors,* and *risk factors* were search terms used to find the relevant articles and are compiled in a table (see Appendix A). Four articles were also added after searching through references lists of previously selected articles. Selection criteria included articles written in English, articles that discussed a relationship between adverse childhood experiences and substance use or discussed a factor affecting the relationship, and articles published after 2010. Articles were excluded during the abstract screen if they were duplicates of previously selected articles, if they did not mention substance use disorder as a negative outcome of adverse childhood experiences, or if they didn't mention a factor affecting the relationship.

The PRISMA flow diagram (see Appendix B) shows the process of the selection of articles included in the review. One hundred and thirty-five articles were found with the initial search criteria. Ninety-six of these articles were excluded by title and abstract. Thirty-nine articles were then retrieved for full-text evaluation; twenty-three of these articles were excluded because they did not fit the inclusion criteria for this review. Four articles were added in after

searching through selected articles' reference lists. A total of twenty articles were selected for inclusion in the systematic review.

A critical appraisal of each study was then conducted using the weight of evidence (WoE) framework (Gough, 2007; Weed, 2005). Each article was rated for methodological quality (WoE A), methodological relevance (WoE B), and topic relevance (WoE C). Methodological quality is the only criteria that is not review-specific and includes a rating that evaluates the overall quality of the study. Methodological relevance is review-specific and is a rating that evaluates the study design's appropriateness to answer the review question. Topic relevance is review-specific and is a rating that evaluates the study's focus to answer the review's question. The articles were given a rating of low, medium, or high for each of the three criteria. A low methodological relevance was grounds to not include that article in the systematic review.

Chapter 3

Findings

Twenty articles were included in this systematic review of the literature. Of the twenty articles, fourteen were cross-sectional in design (Hughes et al., 2019; Kim et al., 2019; Brett et al., 2018; Chandler et al., 2018; Forster et al., 2018; Kiburi et al., 2018; Mergler et al., 2018; Shin et al., 2018; Burnette et al., 2017; Choi et al., 2017; Stein et al., 2017; Claro et al., 2016; Fuller-Thomson et al., 2016; Wu et al., 2010). Two of the cross-sectional studies utilized a latent class analysis (Kim et al., 2019; Shin et al., 2018). Five of the articles were longitudinal (Sheffler et al., 2019; Oshri et al., 2018; Brown & Shillington, 2017; Moses & Villodas, 2017; Jääskeläinen et al., 2016). One study was a double-blind cross over experiment (Lovallo et al., 2018). Sample sizes for the studies ranged from 30 (Chandler et al., 2018) to 168,203 participants (Claro et al., 2016).

Tools used to measure adverse childhood experiences varied by study. The most common measurement tool used was an Adverse Childhood Experience Questionnaire adapted from original CDC-Kaiser Permanente ACE study. These questionnaires either included all original questions or shortened the questionnaire to include nine to ten different categories of ACEs (Brett et al., 2018; Kiburi et al., 2018; Oshri et al., 2018; Burnette et al., 2017; Moses & Villodas, 2017; Stein et al., 2017). The Childhood Trauma Questionnaire was the next most common tool to assess early adversity (Mergler et al., 2018; Shin et al., 2018). Other tools used to assess adversity included the Positive and Adverse Childhood Events Survey (Chandler et al., 2018), the post-traumatic stress disorders section of the C-DIS-IV (Lovallo et al., 2018), the National Survey of Child and Adolescent Well-being (Brown & Shillington, 2017), the Childhood Experiences of Violence Questionnaire-Short Form (Fuller-Thomson et al., 2016),

and the Life Stressor Checklist-Revised (Wu et al., 2010). The study conducted by Jääskeläinen et al. (2016) obtained data from various Finnish national administrative registers and utilized the data to determine ACE scores as opposed to a retrospective questionnaire.

Instruments used to measure substance use included the National Epidemiologic Survey on Alcohol and Related Conditions III (Kim et al., 2019), the Daily Drinking Questionnaire, the Brief Young Adult Alcohol Consequences Questionnaire (Brett et al., 2018), the Alcohol, Smoking and Substance Involvement Screening Test (Kiburi et al., 2018) the European Addiction Severity Index (Mergler et al., 2018), the Alcohol Use Disorders Identification Test (Oshri et al., 2018), the Rutgers Alcohol Problem Index (Shin et al., 2018), the Six-item CRAFFT survey (Brown & Shillington, 2017), the Alcohol Use Disorder and Associated Disabilities Interview Schedule, and the National Epidemiologic Survey on Alcohol and Related Conditions (Choi et al., 2017). Other studies did not utilize a specific tool, but asked questions to participants about various forms of substance use and substance use behaviors.

The characteristics of the 20 total articles included in this systematic review of the literature were synthesized into a matrix (see Appendix C). Each article was reviewed for purpose, sample, design, instruments used, key findings, and strengths and limitations. The articles in this matrix are arranged by year from most current to least current.

A breakdown of the various types of adverse childhood experiences are the first findings presented in this section. These types of ACEs include: emotional neglect/abuse, physical abuse, sexual abuse, witnessing domestic violence, incarcerated household member, and parental or other household member's substance. Next, data on the incidence of ACEs and the effect on substance use are presented. Then, data regarding negative outcomes that occur after ACEs are

presented. These negative outcomes are consequences of ACEs that may predispose individuals to substance use. Finally, data gathered on modifiable and nonmodifiable variables are presented.

Types of Adverse Childhood Experiences in Relation to Substance Use

Emotional Neglect and Emotional Abuse

Four out of the twenty articles included in the review reported results that showed the relationship between emotional neglect and substance use (Choi et al., 2017; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019) In the study conducted by Choi et al. (2017), researchers found that emotional neglect was not significantly related to substance use. Kiburi et al. (2018) found that emotional neglect was associated with cannabis dependence, and emotional abuse was associated with current and lifetime tobacco and sedative use. Shin et al. (2018) found that the rates alcohol-related problems and tobacco use were higher in a group of participants who endorsed high levels of emotional neglect and emotional abuse among other ACEs, when compared to a group of participants who reported low levels of adversity. Kim et al. (2019) found that a group of the sample population who reported high levels of emotional abuse/neglect among other ACEs, were more likely to have a substance use issue within the past year when compared to a group who reported low adversity.

Physical Abuse

Six of the twenty articles included in this review reported results showing the relationship between physical abuse and substance use (Choi et al., 2017; Forster et al., 2018; Fuller-Thomson et al., 2016; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). Choi et al., (2017) discovered that physical abuse was significantly associated with three substance use outcomes

relating to alcohol, drugs, and nicotine. Forster et al. (2018) found no interaction between physical abuse and alcohol use, cannabis, or nicotine. Fuller-Thomson et al. (2016) found that physical abuse was significantly associated with drug dependence. Kiburi et al. (2018) found that physical abuse was significantly associated with sedative and cannabis use. Shin et al. (2018) found that in a group of the sample population who endorsed high levels of physical abuse and other ACEs, the likelihood of alcohol-related problems and use of tobacco was increased when compared to the group that reported low adversity. Kim et al. (2019) found that in a group of the sample that reported increased physical abuse and other ACEs, the likelihood of substance use disorders was increased in comparison to the group who reported low adversity.

Sexual Abuse

Five of the twenty articles included in this review reported results regarding sexual abuse and the relationship to substance use (Choi et al., 2017; Forster et al., 2018; Fuller-Thomson, et al.; Shin et al., 2018; Kim et al., 2019)**.** Choi et al. (2017) reported that sexual abuse was correlated with alcohol, drug, and nicotine use. Forster et al. (2018) reported that sexual abuse was correlated with a number of substance use behaviors including past 30-alcohol use, past 30-day tobacco use, past 30-day marijuana use, past 30-day illicit drug use, past 12-month prescription drug abuse, and past 12-month polysubstance use. Fuller-Thompson et al. (2016) found sexual abuse to be positively correlated with alcohol and drug dependence. Shin et al. (2018) found that in a group of the sample population who experienced sexual abuse and other ACEs, the likelihood of alcohol-related problems and use of tobacco was increased in comparison to the group that reported low adversity. Kim et al. (2019) found that in a group of the sample who reported increased sexual abuse and other ACEs, the likelihood of substance use disorders was increased in comparison to the group that reported low adversity.

Witnessing Domestic Violence

Six of the twenty articles included in this review reported results showing the relationship between witnessing domestic violence and substance use (Choi et al., 2017; Forster et al., 2018; Fuller-Thomson et al., 2016; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). Choi et al. (2017) found that witnessing domestic violence was not related to substance use disorder. Forster et al. (2018) found that witnessing parental or intimate partner violence was correlated with substance use behaviors including past 30-alcohol use, past 30-day tobacco use, past 30-day marijuana use, past 30-day illicit drug use, past 12-month prescription drug abuse, and past 12-month polysubstance use. Fuller-Thomson et al. (2016) reported that witnessing domestic violence ten or more times was associated with substance dependence. Kiburi et al. (2018) reported that witnessing violence against a household member was correlated with increased risk of lifetime alcohol and tobacco use. Shin et al. (2018) noted that within a group of the sample population who reported increased exposure to violence and household dysfunction and other ACEs, tobacco use was increased when compared to the group that reported low adversity. Kim et al. (2019) found that within a group of the sample population who reported witnessing intimate partner violence and other ACEs, the likelihood of substance use disorders was increased when compared to the group of the sample who reported low adversity.

Incarcerated Household Member

Four of the twenty articles included in this review discussed the relationship between household member incarceration and substance use; the results were varied (Choi et al., 2017; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). Choi et al. (2017) did not find a significant relationship between parental/other household member's incarceration and any substance use outcome. Kiburi et al. (2018) did not find a significant relationship between an

incarcerated household member and substance abuse. Shin et al. (2018) found that within a group who reported having a household member incarcerated among other ACEs, the likelihood of tobacco and alcohol use was increased when compared to the portion of the sample who reported low adversity. Kim et al. (2019) found that within a group who reported having a household member incarcerated among other ACEs, the likelihood of substance use was increased when compared to the portion of the sample who reported low adversity.

Parental or Other Household Member's Substance Use

Five of the twenty articles included reported results showing a positive correlation between substance use and parental or other household member's substance use (Choi et al., 2017; Forster et al., 2018; Shin et al., 2018; Kim et al., 2019; Jääskeläinen et al., 2016). Kiburi et al. (2018) discussed the relationship between substance use and parental or other household member's substance use but did not find a significant relationship. Choi et al. (2017) found that there was a positive association between parental or other household member's substance use and alcohol, drug, and nicotine use. Forster et al. (2018) reported that parental substance use was correlated with substance use behaviors including past 30-alcohol use, past 30-day tobacco use, past 30-day marijuana use, past 30-day illicit drug use, past 12-month prescription drug abuse, and past 12-month polysubstance use. Shin et al. (2018) found that within a group of the sample population who reported parental or other household member's substance use along with other ACEs, tobacco use was increased when compared to the portion of the sample reporting low adversity. Kim et al. (2019) found that within a group of the sample who reported parental substance use, substance use was increased when compared to the group of the sample who reported low levels of adversity. Jääskeläinen et al. (2016) found that parental substance use was positively correlated with substance use later on.

Cumulative Adverse Childhood Experiences in Relation to Substance Use

Half of articles included in this systematic review reported the effects of cumulative ACEs on substance use (Brett et al., 2018; Brown & Shillington, 2017; Chandler et al., 2018; Choi et al., 2017; Forster et al., 2018; Shin et al., 2018; Kim et al., 2019; Stein et al., 2017; Lovallo et al., 2018; Wu et al., 2010). Brett et al. (2018) found that cumulative ACEs were positively correlated with increased alcohol intake and increased alcohol-related consequences. Brown and Shillington (2017) reported that youth in the study who reported increased childhood adversity were more likely to engage in substance use. The population used for the study by Chandler et al. (2018) consisted of individuals seeking treatment for substance use disorder of which 82.8% reported having experienced four or more ACEs in comparison to 24.64% of the general population reporting three or more ACEs. Choi et al. (2017) found that a one increment increase in ACE score was associated with an increase in odds of 1.21 for alcohol use disorder, 1.27 for drug use disorder, and 1.19 for nicotine use disorder. Choi and colleagues (2017) also found that post-traumatic stress disorder somewhat decreased the odds ratios for the number of ACEs, but the relationship was still significant. Forster et al. (2018) found a strong, positive association between individual and accumulated ACEs and substance use, though the type of substance use varied by ethnicity. Shin et al. (2018) reported that young adults who had exposure to multiple ACEs were at higher risk for alcohol-related problems and current tobacco use than those who had low or no exposure to ACEs. Kim et al. (2019) reported that the group within the sample reporting multiple types of ACE exposure (i.e. physical abuse, emotional abuse, neglect, etc.) were most likely to use substances. A study conducted by Lovallo et al. (2018) found that exposure to three or more ACEs was associated with reduced cortisol response to stress which is associated with abusive intake of alcohol and experimentation with drugs. Stein et al. (2017)

found that the number of ACE items endorsed was positively associated with three facets of opioid drug use: younger age of initiation, ongoing injection drug use, and increased lifetime experiences of overdose. Wu et al. (2010) found that each unit increase in reported ACEs increased the risk of current tobacco use and lifetime alcohol dependence by 18% and 16%, respectively.

Negative Outcomes of Adverse Childhood Experiences Contributing to Substance Use

Various negative outcomes are noted in the articles that were observed following the occurrence of ACEs. These negative outcomes include increased impulsivity, a change in physiological response to cortisol, and poor mental health. These negative outcomes may predispose individuals to substance use. Oshri et al. (2018) aimed to determine if impulsivity would explain the effects of childhood abuse and neglect on the frequency of substance use in young adulthood. Oshri and colleagues (2018) found that exposure to child abuse and neglect was associated with increased impulsive behaviors from middle to late adolescence. This subsequently predicted cigarette and cannabis use in young adulthood. These data indicated that child abuse and neglect were indirectly associated with cigarette and cannabis use via impulsivity. Results from this study did not confirm a pathway relating ACEs to alcohol use via impulsivity.

Lovallo et al. (2018) conducted a study to determine how the body's physiological stress response changes after exposure to childhood traumatic events. This was conducted by measuring cortisol levels in women with varying degrees of ACE exposure after administration of naltrexone, a medication that blocks opioid receptors and produces physiological stress on the

body. The natural response of the body to naltrexone is to secrete cortisol. Lovallo et al. (2018) found that cortisol secretion was suppressed in women with higher levels of ACE exposure. The hypothalamic-pituitary-adrenal (HPA) axis controls cortisol section and regulates inhibition behavior. Dysfunction of this structure is associated with substance use (Lovallo et al., 2018)

Fuller-Thomson et al. (2016) found that chronic pain, insomnia, lifetime depression, and smoking status all somewhat strengthen the relationship between ACEs and lifetime substance and alcohol dependence, but they do not explain the relationship entirely. In a study by Mergler et al. (2018), participants were split into three categories: those who experienced high/moderate childhood trauma and met criteria for post-traumatic stress disorder (CT-PTSD), those who experienced high/moderate childhood trauma but did not meet criteria for PTSD (CT-only), and those who reported little to no childhood trauma. These groups were then examined for differences in drug and alcohol dependence outcomes. Mergler et al. (2018) found that the CT-PTSD group was significantly younger at the time of first alcohol use in comparison to the CT-only group. Wu et al. (2010) conducted a study among a population with comorbid substance use and mental health diagnoses and found that childhood trauma was significantly more common than in the general population. Jääskeläinen et al. (2016) found that that having mental health problems in mid-childhood predicted harmful substance use in adolescence. Kim et al. (2019) found that the probability of substance use was significantly higher in the presence of major depressive disorder and high number of ACEs or ACEs related specifically to child abuse.

Nonmodifiable Variables

Gender

Choi et al. (2017) found that for men, physical abuse was a significant factor for alcohol use disorder. Also, for men, parental divorce was a significant factor for alcohol use disorder, drug use disorder, and nicotine use disorder. The relationship between sexual abuse and drug use disorder was found to be stronger for men than for women. The positive association between parental or other adult's mental illness and nicotine use disorder was significant only for women. Choi et al. (2017) also found that males were more likely in general to experience alcohol, drug, and nicotine use disorder. The study conducted by Fuller-Thomson et al. (2016) found no differences in gender on substance use outcomes. Mergler et al. (2018) found that female gender was associated with younger age at first alcohol use, more cannabis use in the last month and years of cannabis use, and higher number of drug overdoses. Shin et al. (2018) found that females were more likely to be in a group who experienced a high number and variety of ACEs. Oshri et al. (2018) found that being male predicted increased cigarette use and cannabis use. Wu et al. (2010) found no differences among gender. Brett et al. (2018) found that being female predicted lower reported drinks per week and being male predicted increased experience of alcohol-related consequences.

Age

Choi et al. (2017) found that being older decreased the odds of lifetime alcohol, drug, and nicotine use. Shin et al. (2018) found that as a participant's age increased, the more likely they were to be part of a group who endorsed a greater number and variety of ACEs. Kim et al. (2018) found that the positive correlation between ACEs and substance use was consistent across age. Hughes et al. (2019) found that smoking and drug use was more common among older participants in the sample.

Race

Choi et al. (2017) found that in their sample of non-Hispanic Whites, non-Hispanic Blacks, Hispanics, non-Hispanic Asian/Pacific Islander, and American Indian/Alaskan Native, being Black, Hispanic, or Asian was associated with lower odds of lifetime alcohol use, drug use, and nicotine use. Burnette et al. (2017) found that the mean ACEs score 2.55 of American Indian/Alaskan Native older adults was significantly higher than the mean score 0.83 of the non-AI/AN older adult population. Forster et al. (2018) found that among a sample of non-Hispanic Whites, Hispanics, Blacks, non-Hispanic Asian/Pacific Islanders, Multiracial, and Other, there were differences in cumulative ACE scores, the substance of choice, and the rate of substance use in the last twelve months. Cumulative ACEs were associated with increased odds of past 30-day alcohol use among Blacks, Hispanics, non-Hispanic Asian/Pacific Islanders, and Multiracial groups. Cumulative ACEs were associated with higher odds of tobacco use for non-Hispanic Whites, Hispanics, and non-Hispanic Asian/Pacific Islanders. Cumulative ACEs were associated with increased odds of marijuana use in all racial groups except Blacks, and increased odds of illicit drug use among non-Hispanic Whites, non-Hispanic Asian/Pacific Islanders, and Others. For prescription medication use, the odds increased among non-Hispanic Whites, Hispanics, and non-Hispanic Asian/Pacific Islanders. Cumulative ACEs were associated with higher rates of substance use in the last twelve months for non-Hispanic Whites, Hispanics, non-Hispanic Asian /Pacific Islanders, and multiracial groups (Forster et al., 2018). Wu et al. (2010) found that Blacks reported increased exposure to ACEs compared to other races.

Socioeconomic Status

Choi et al. (2017) found that receiving welfare before 18 years of age was associated with higher odds of lifetime nicotine use. Choi et al. (2017) also found that having a college degree decreased odds of lifetime drug and nicotine use. Fuller-Thomson et al. (2016) found that when

socioeconomic status is taken into consideration, the association between ACEs and substance/alcohol dependence is somewhat weaker, but it does not completely attenuate the relationship. Shin et al. (2018) conducted a study in which three groups of related ACEs were identified and quantified among a population. The study found that lower family income increased the odds of experiencing ACEs. Jääskeläinen et al. (2016) found that living in a non-intact family, a family's long-term poverty, and low socioeconomic status are significant predictors of mental disorders and harmful substance use. Jääskeläinen et al. (2016) also found that a family's receipt of social assistance was a significant predictor of harmful substance use later on. Hughes et al. (2019) found that substance use issues were associated with low socioeconomic status in childhood.

Substance Use or Mental Illness in the Household

Jääskeläinen et al. (2016) found that parental substance use was associated with increased use of substances in adolescence. They also discovered that parental mental disorders have an independent, positive association with adolescents' mental disorders and harmful substance use. Kiburi et al. (2018) found that lifetime sedative use was found to be positively associated with having someone with a mental illness in the household. Having someone with mental illness in the household also increased the risk of current tobacco use by five times. Choi et al. (2017) found that parental or other adult's mental illness was a significant factor for alcohol use issues and drug use issues. In addition, parental or other adult's mental illness was marginally significant for nicotine use issues. Kim et al. (2018) found that those who reported a family or household member's substance use were more likely to have substance use issues later on.

Modifiable Variables

It is difficult to discuss modifiable variables individually because they are all interrelated to some degree, but this systematic review discusses social support, coping strategies, growth mindset, mindfulness, and resilience as separate, but related, protective factors against ACEs.

Social Support

The study conducted by Moses and Villodas (2017) aimed to discover if ACEs were associated with worse school performance outcomes in a sample of 16-year olds and if positive peer relationships were a protective factor. Moses and Villodas (2017) found that ACEs were associated with school dropout contemplation, decreased perception of school importance, decreased odds of grade completion, and decrease prosocial activity. They found that despite high levels of adversity, peer companionship and intimacy served as protective factors to reduce the incidence of negative outcomes. In addition, the presence of peer conflict in place of positive peer relationships exacerbated the effect of ACEs on school dropout contemplation and perceptions of school importance (Moses & Villodas, 2017).

A study by Brown and Shillington (2017) measured ACEs and substance use while considering protective adult relationships as a mediator variable. Ten ACEs were measured to develop a cumulative ACE score. Protective adult relationships were measured using five questions and higher scores indicated higher protective adult relationships. Substance use was assessed using the Car, Relax, Alone, Forget, Friends, Trouble (CRAFFT) youth self-report questionnaire and higher scores indicated greater substance use. Brown and Shillington (2017) found that protective adult relationships moderated the relationship between ACEs and substance use such that ACEs were more strongly correlated with substance use when youth reported less protective adult relationships.

In a study conducted by Hughes et al. (2019), the Family Health History survey and the ACE questionnaire were used to measure cumulative ACEs, supportive childhood relationships and various substance use and health outcomes. Hughes et al. (2019) found that greater childhood support was associated with reduced risk of smoking, problem alcohol use, therapy and suicide attempt.

The research study by Burnette et al. (2017) aimed to discover if perceived social support could buffer depressive symptoms in a population that had experienced ACEs. The study compared an American Indian/Alaskan Native population to a non-AI/AN population and discovered that the AI/AN group experienced higher incidence of ACEs, but they reported similar amounts of depressive symptoms and social support. Burnette et al. (2017) showed that greater perceived social support was negatively correlated with depressive symptoms and protected against suicide in both populations.

Coping Strategies

As stated previously, ACEs can lead to various negative outcomes predisposing one to use substances. These outcomes affect the way an individual physiologically and behaviorally responds to stress (Forster et al., 2018). Adaptive coping strategies aimed at reducing a stressor can reduce the effects of ACEs on the body's stress response (Sheffler et al, 2019). A study conducted by Sheffler et al. (2019) showed that coping styles are a modifiable pathway between ACEs and later physical and mental health issues. The study discussed two different coping styles: avoidant, emotion focused (AEF) coping and problem focused (PF) coping. PF coping focuses on resolving the problem that is causing stress, it can lead to self-efficacy, and it is effective for stress management in adulthood whereas AEF coping only makes the person temporarily feel better but does not eliminate the problem and can lead to numerous physical and

mental health problems (Sheffler at al., 2019). The researchers found that AEF coping partially mediated the relationship between ACEs and negative outcomes.

Growth Mindset

The growth mindset was conceptualized by Dweck (1998). Her research along with her colleagues presented two different mindsets that result in a difference in motivation, effort, approach to challenges, and beliefs about one's intelligence. Having a growth mindset means a person believes that intelligence can be developed and they will be more likely to embrace challenges, persist in spite of difficulties, see effort as necessary for success, learn from criticism, and learn from the successes of others. In contrast, a person with a fixed mindset will avoid challenges, give up easily after failure, find little value in effort, ignore constructive criticism, and feel threatened by others' success (Claro et al., 2016).

A study conducted by Claro et al. (2016) looked at growth mindset, socioeconomic status (SES), and academic achievement across a sample of 10th grade students in Chile. They found that students of lowest SES status were twice as likely as students of the highest SES status to report a fixed mindset. They discovered that those who had a growth mindset consistently outperformed those with a fixed mindset, even when SES was taken into consideration. The study states "…for any two students with equal characteristics, the one endorsing a growth mindset is more likely to enjoy higher academic achievement..." (Claro et al., 2016, pg. 4). The study states that mindset was more predictive of academic achievement in the low SES population (Claro et al., 2016).

Mindfulness

Brett et al. (2018) looked at how mindfulness may affect the relationship between adverse childhood experiences and alcohol use. ACEs were measured using the Adverse Childhood

Experiences Questionnaire – Short Form. Alcohol use was measured by assessing number of drinks per week using the Daily Drinking Questionnaire, and by assessing consequences experienced related to drinking by using the Brief Young Adult Alcohol Consequences Questionnaire. Mindfulness was measured using the Five Facet Mindfulness Questionnaire which assesses five facets of mindfulness: acting with awareness, nonjudging, nonreactivity, observing, and describing. Brett et al. (2018) found that cumulative ACEs were negatively associated with mindfulness and positively associated with alcohol consequences. Mindfulness was negatively correlated with drinks per week and alcohol-related consequences. It was found that mindfulness mediated the relationship between ACEs and drinks per week/alcohol-related consequences. Specifically, this study found that the "acting with awareness" and the "nonjudgement" facets of mindfulness mediated the relationship between ACEs and alcohol use.

Resilience

Resilience can be conceptualized as the ability to successfully adapt after experiencing adversity (Moses & Villodas, 2017). Studies included in the modifiable variables section of this systematic review name factors that promote resilience in those who have experienced ACEs. Moses and Villodas (2017) show that good quality peer relationships can buffer the effect of ACEs on academic performance. Brown and Shillington (2017) show that protective adult relationships moderated the relationship between ACEs and substance use and that ACEs were more strongly associated with substance use in the absence of positive adult relationships. Hughes et al. (2019) reported that childhood support was associated with reduced negative outcomes. Burnette et al. (2017) found that greater perceived social support decreased depressive symptoms in those who had experienced ACEs. Sheffler et al. (2019) showed that use of avoidant, emotion focused coping partially mediated the relationship between ACEs and

negative outcomes. Claro et al. (2016) found that mindset was a strong predictor of success among high adversity youth and those who had a growth mindset consistently outperformed those with a fixed mindset regardless of socioeconomic status. Brett et al. (2018) reported that increased levels of mindfulness were associated with less risky drinking behaviors.

Chapter 4

Discussion

The purpose of this systematic review was to examine the relationship between adverse childhood experiences and substance use and to determine which factors affect the relationship. The questions this review sought to answer were ‘How are adverse childhood experiences and substance use correlated?’ and ‘What variables affect this correlation?’ The articles included in this systematic review used various tools to measure adverse childhood experiences and substance use to study their relationship. The majority of the articles were cross-sectional, four were longitudinal, and one was a double-blind crossover study. Evidence shows that child abuse, sexual abuse, witnessing violence in the household, and presence of substance using parent or other household member were more likely to be positively correlated to substance use than other types of ACEs. Experiencing a higher incidence of ACEs was found to be more significant than experiencing one type of ACE. There is a strong relationship between increasing ACEs and increased risk for substance use. The negative outcomes of ACEs are well documented, but there are protective factors that lessen the impact of ACEs that can be cultivated. Findings are discussed in more detail below.

Types of Adverse Childhood Experiences in Relation to Substance Use

Each article included in the systematic review reported that ACEs increase substance use and risk for substance use. However, there is some disagreement in the current literature regarding the degree to which each individual type of ACE (emotional abuse/neglect, physical abuse, sexual abuse, an incarcerated household member, witnessing domestic violence, and a

household member's substance use) independently affects substance use. Many articles report that certain types of ACEs were independently associated with substance use, but there were some studies that found no such associations (Choi et al., 2017; Forster et al., 2018; Kiburi et al., 2018)

Three of the four articles that assessed the independent association of emotional abuse/neglect to substance use reported a positive correlation (Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). The substance most correlated with emotional ACEs was nicotine. Kiburi et al. (2018) found that nicotine use increased by 22.8 times in the group who reported emotional ACEs. The mood elevating properties of nicotine may be the reason individuals with emotional ACEs develop a habit of smoking (Kiburi et al., 2018). Five of the six articles that assessed the independent association of physical abuse to substance use reported a positive correlation (Choi et al., 2017; Fuller-Thomson et al., 2016; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). Physical abuse increases the risk of many types of substance use including sedatives, cannabis, nicotine, alcohol, and other drugs. All five articles that looked at the independent association of sexual abuse and substance use reported a positive correlation (Choi et al., 2017; Forster et al., 2018; Fuller-Thomson, et al.; Shin et al., 2018; Kim et al., 2019). Sexual abuse was positively associated with alcohol, nicotine, prescription drug use, and substance dependence. Five of the six articles assessing the independent association of domestic violence to substance use reported a positive correlation (Forster et al., 2018; Fuller-Thomson et al., 2016; Kiburi et al., 2018; Shin et al., 2018; Kim et al., 2019). Witnessing domestic violence was associated with various substance use behaviors, substance dependence, and lifetime alcohol and tobacco use. Two of the four articles that discussed the relationship between an incarcerated household member and substance use reported a positive association (Shin et al., 2018; Kim et

al., 2019). In the articles that reported a positive association, an incarcerated family member increased the likelihood of alcohol and tobacco use. Five of the six articles that assessed the independent association of substance use and parental or other household member's substance use reported a positive correlation (Choi et al., 2017; Forster et al., 2018; Shin et al., 2018; Kim et al., 2019; Jääskeläinen et al., 2016). Household member's substance use increased the likelihood of current alcohol, drug, and nicotine use, lifetime alcohol and nicotine use, various substance use behaviors, and substance dependence.

The individual ACEs discussed in this review are emotional abuse/neglect, physical abuse, sexual abuse, witnessing domestic violence, incarcerated household member, and parental or other household member's substance use. Physical abuse, sexual abuse, parental or other household member's substance use, and witnessing domestic violence are the individual ACEs most consistently reported to be positively associated with substance use. The findings in the articles included in this systematic review are consistent with previous research that reported direct, violent types of ACEs and witnessing violence were positively associated with negative outcomes. Previous studies found that preventing ACEs related to physical abuse, witnessed abuse, or sexual abuse would decrease suicide attempts by 50% in women and 33% in men (Baglivio et al., 2015; Afifi et al., 2008). The finding that a household member's substance use is associated with later substance use is also consistent with other literature. Previous studies reported that the presence of a family member with substance use issues strongly predicted substance use in other family members, which was explained by both genetic vulnerability and exposure to an adverse family environment (Chartier et al., 2010; Choi et al., 2017). Less evidence is present for the independent association between emotional ACEs and household member incarceration. Because physical abuse, sexual abuse, household substance use, and

domestic violence are the most correlated with substance use, additional research should be focused on prevention of these ACEs. It is difficult to separate the individual effect of each type of ACE because they often occur simultaneously (Kim et al., 2018). This aligns with previous research that demonstrated occurrence of one ACE increased the likelihood of experiencing other childhood adversities (Oladeji et al., 2010; Anda et al., 1999). Studying the individual effect of ACEs may not be as useful as studying how various groups of ACEs are likely to occur together and how the presence of one type of ACE may increase the likelihood experiencing ACEs in that same grouping.

Cumulative Adverse Childhood Experiences in Relation to Substance Use

More significant than the effect of any individual type of ACE is the effect of cumulative ACEs. There is a strong, positive correlation between the number of ACEs experienced and increased substance use or risk of substance use. Individuals who experience a higher incidence or multiple types of ACEs are more at risk for substance use than those who experience no ACEs or those who experience only one type of ACE (Shin et al., 2018). While in most studies, those reporting high/multiple ACEs were the smallest group, they are the group that is most concerning because they are at high risk for developing negative outcomes (Shin et al., 2018). Overall, this systematic review is consistent with previous research that has demonstrated that increased adversity is related to substance use.

Negative Outcomes of Adverse Childhood Experiences Contributing to Substance Use

Researchers reported that impulsivity was a mechanism in the relationship between ACEs, nicotine, and cannabis use (Oshri et al., 2018). Research suggests that ACEs may alter the development of important brain structures and these alterations can lead to the development of impulsive behaviors and a tendency toward substance use (Hosking & Winstanley, 2011). A brain/physiological structure that is affected by ACEs and regulates behavior associated with substance use is the HPA axis. The structures of the HPA axis are regulated by cortisol feedback during states of stress (Lovallo, 2006). Dysregulation of the system can result in reduced control over motivated behavior, which compromises affect and behavioral regulation processes associated with vulnerability to substance use. Altered HPA axis function and dysregulated release of cortisol have been associated with the development of substance use (Lovallo et al., 2018). Harsh rearing environments are shown to affect stress reactivity measured by HPA axis and cortisol regulation (Cicchetti et al., 2011). Lovallo et al. (2018) found that women who had experienced more ACEs showed a dysregulation of the HPA axis when exposed to a physiological stressor.

Several articles included in the review name mental health as a significant variable in the relationship between ACEs and substance use. Fuller-Thomson et al. (2016) found that a history of depression and anxiety is important in explaining the relationship between abuse and substance dependence. Kim et al. (2019) found that the probability of substance use was significantly higher in the presence of major depressive disorder in addition to high incidence of ACEs or ACEs related to child abuse. Mergler et al. (2018), found that those who reported both PTSD and ACEs were significantly younger at the time of first alcohol use and were worse off on other substance use behaviors in comparison to those who did not have PTSD in addition to

ACEs. Other studies also found similar results when comparing populations reporting PTSD and trauma, trauma only, and no trauma (Tate et al., 2007). Jääskeläinen et al. (2016) found that having mental health problems in mid-childhood predicted harmful substance use in adolescence which was consistent with previous research (Goodman, 2010). These findings are expected considering the high rate of mental illness among adults who have experienced ACEs (Fergusson et al., 2008; Li et al., 2016) and the strong, positive correlation between mood and anxiety disorders and substance dependence (Compton et al., 2007; Hasin et al., 2007).

Nonmodifiable Variables

Nonmodifiable variables discussed in this review include gender, age, race, substance use or mental health issues of household member, and socioeconomic status. There was no agreement in the literature regarding the effect of gender. Choi et al. (2017) found that certain types of abuse were strongly associated with substance use, but the positive correlation was more significant in males. Mergler et al. (2018) found that female gender was associated with substance use behaviors and more overdoses. Brett et al. (2018) found the being female predicted lower substance use behaviors. There was inconsistency regarding the role of gender and each article presented slightly different results. The discrepancy could be due to males or females being more likely to experience a certain type of trauma over another, cultural differences, variations in coping strategies between men and women, or co-morbid mental health diagnoses (Choi et al., 2017; Forster et al., 2018; Mergler et al., 2018).

There was little agreement among the articles regarding the effect of age. Choi et al. (2017) found that being older decreased the odds of lifetime alcohol, drug, and nicotine use. Kim

et al. (2018) found that the positive correlation between ACEs and substance use was consistent across age. Hughes et al. (2019) found that smoking and drug use were more common among older participants in the sample. Other articles included in the review controlled for age and did not find significant data to suggest an independent association.

No consensus was present for the effect of race. Choi et al. (2017) found that being Black, Hispanic, or non-Hispanic Asian decreased odds of substance use. Forster et al. (2018) categorized various substance use behaviors and found that non-Hispanic Asian/Pacific Islander participants were included in the most categories. Research cited by Forster et al. (2018) stated that non-Hispanic Asian populations may be less inclined to seek treatment for trauma related issues because stressors such as family-based ACEs are private matters that could be stigmatizing (Roberts et al., 2011; Yoshioka et al., 2000). Other than this, no explanation is available for the differences found in race. It appears that ACEs affect every race, but the incidence and outcomes vary greatly depending on the study design and sample population.

There was strong evidence presented in the articles for a positive correlation between a household member's substance use or mental illness and the development of substance use. Each article that discussed a household member's substance use or mental illness as an ACE found that it increased the likelihood of using substances. Hughes et al. (2019) discussed the reason behind this and stated that children who experience ACEs are at increased risk of developing behaviors (e.g. substance use) and conditions (e.g. mental illness) than can later become ACEs for their own children, consequently increasing the risk of such behaviors and conditions being transmitted across generations.

Several articles included in this review reported that low socioeconomic status was positively associated with increased experience of ACEs (Shin et al., 2018; Hughes et al. 2019).

The study conducted by Choi et al. (2017) reported that being college educated decreased risk for substance use. This finding shows the importance of educational attainment and associated socioeconomic resources in lessening the impact of ACEs. Inferences that can be drawn from this, are that if those that experience ACEs can positively change their socioeconomic status in adulthood by attending college, they are less likely to engage in substance use.

Modifiable Variables

Modifiable variables discussed in this systematic review include social support, coping strategies, growth mindset, mindfulness, and resilience. Moses and Villodas (2017) conducted a study looking at poor academic outcomes as a consequence of adversity. The purpose of their study was to discover if peer relationships are a protective factor in the association between ACEs and poor academic outcomes. Their study showed that ACEs are correlated with lower grade completion, decreased perception of school importance, dropout contemplation, and decreased prosocial activity engagement (Moses & Villodas, 2017). Facets of peer relationships were measured by the study and they included peer conflict, peer companionship, peer intimacy, and relationship satisfaction. High intimacy was protective against ACEs effect on prosocial activity engagement. This may be because adolescents who have close peer relationships feel more supported to engage in positive extracurricular activities. Intimate and supportive relationships can promote self-worth and self-efficacy which enhance the ability to overcome adversity (Moses and Villodas, 2017). Peer companionship was protective against the effects of ACEs on perceived school importance, but only when students also reported low conflict. When conflict was high, the impact of ACEs on perceived school importance was emphasized even in

the presence of high companionship. Previous research has shown that deviant peer relationships have been shown to be high in conflict and high in companionship (Dishion et al. 1995; Marcus 1996). These deviant attitudes and behaviors are adopted by adolescents and one manifestation could be low perception of school importance (Moses & Villodas, 2017). This research demonstrates that good quality peer support can act as a protective factor against ACEs and promote positive outcomes. Brown and Shillington (2017) and Hughes et al. (2019) found that positive adult relationships impacted the association between ACEs and substance use. Brown and Shillington (2017) discovered ACEs were more strongly correlated with substance use when youth reported less protective adult relationships. Previous studies also found that the absence of supportive adult relationships or poor-quality adult relationships are associated with elevated risk-behaviors (Hildyard & Wolfe, 2002; McLanahan et al., 2013; Zhang et al., 2014). The added stress youth may feel as a result of having few supportive relationships, particularly during a critical developmental period may be responsible for the negative outcomes (Ellis et al., 2003). The study by Hughes et al. (2019) found that greater supportive childhood relationships were associated with reduced risk of smoking, problem alcohol use, therapy and suicide attempt. Supportive relationships with caregivers or other trusted adults can enable children to cope with stress and develop healthy stress response systems. These relationships can provide children who experienced ACEs with an opportunity to recover, providing protection against the toxic effects of extreme stress on brain development. Without supportive relationships, individuals can become overloaded from the repeated stress increasing vulnerability to negative outcomes (Wadsworth, 2015). Burnette et al. (2017) looked at an American Indian/Alaskan Native population in comparison to a non-AI/AN population and found that AI/AN population experienced almost 3 times as many ACEs. Their hypothesis was that the AI/AN population

would also report more depressive symptoms and less social support which was not the case. They found that child abuse and household dysfunction predicted depressive symptoms in the AI/AN population and perceived social support buffered depressive symptoms in both populations (Burnette et al., 2017). This further shows the importance of social support in reducing the negative outcomes associated with ACEs.

The study by Brett et al. (2018) showed that mindfulness mediated the relationship between ACEs and alcohol use and consequences. Results suggested that lower levels of mindfulness may explain how individuals who have experienced more ACEs are more likely to have increased alcohol intake and experience more consequences related to their drinking. This is one of the first studies to look at mindfulness as a mediator, and while the evidence presented in the article is strong, more research should be conducted to support these results.

Coping strategies were the main focus of the research conducted by Sheffler et al. (2019). They looked at two different types of coping strategies: Avoidant, emotion focused (AEF) coping and problem focused (PF) coping. More frequent use of AEF coping and less frequent use of PF coping is associated with ACEs as ACEs can disrupt emotion regulation and can lead children to believe they have little control over their environment (Sheffler et al., 2019). AEF strategies may be affective in childhood, but become less desirable in adulthood: pouting and emotional displays by children may gain attention of parents, but excessive negativity and emotional outbursts by adults may drive others away. The study found that ACEs were in fact associated with less frequent use of PF coping. PF coping alone did not change the relationship between ACEs and negative outcomes, but increased use of AEF coping exacerbated the relationship (Sheffler et al., 2019). This shows that interventions involving coping strategies can

lessen the impact of ACEs and the most effective approach would be to place the emphasis on reducing the use of the AEF coping.

Claro et al. (2016) aimed to answer the question of whether endorsing a growth mindset rather than a fixed mindset can improve academic outcomes in disadvantaged adolescents. Growth mindset is the belief that intelligence is malleable and can be built upon, whereas a fixed mindset is the belief that intelligence is static. Growth mindset is associated with positive behaviors and beliefs like embracing challenges, learning from criticism, and viewing failure as a learning opportunity whereas a fixed mindset is associated with avoidance of challenges, discouragement in the face of difficulty, and finding little value in effort and hard work (Claro et al., 2016). Claro and colleagues found that more students of lower socioeconomic status endorsed a fixed mindset than students of higher socioeconomic status. They also reported that having a growth mindset predicted better academic performance over those who had a fixed mindset regardless of socioeconomic status (Claro et al., 2016). The study reported that mindset was more of a predictor of academic success for lower SES students than higher SES students. This shows influencing mindset in lower SES or high adversity youth can significantly affect academic performance. Future research should be conducted into growth mindset to see if it also influences other negative outcomes of ACEs.

Resilience can be conceptualized as the ability to successfully adapt and overcome adversity. The modifiable variables discussed in this systematic review all contribute to resilience after the occurrence of ACEs. Social support, effective coping strategies, mindfulness, and growth mindset can all promote positive outcomes and buffer against the harmful effects of ACEs. Research shows that protective adult relationships can promote resilience (Hughes et al., 2019; Rhodes, 2005). Rhodes (2005) states that mentoring relationships can produce positive

outcomes and foster resilience if the bond includes trust and mutual benefit. The study by Brown and Shillington (2017) found a reduction in substance use in the presence of positive adult relationships. However, the study by Chandler et al. (2018) measured protective factors to demonstrate resilience and found that those with substance use issues reported high levels of resilience, contradicting the previous findings of Brown and Shillington (2017). It is possible that the study conducted by Chandler et al. (2018) did not accurately capture resilience. The study measured community involvement, activity and family support to represent resilience. The measurement may have been too broad which led a high percentage of reported resilience. Community involvement may not be a good measurement of quality relationships and resilience since the study by Moses and Villodas (2017) reported that peer intimacy rather than just peer companionship was a better buffer against negative outcomes. Sheffler et al. (2019) shows that reducing AEF coping can promote resilience by reducing the negative outcomes associated with ACEs. Brett et al. (2018) demonstrated that increased mindfulness can promote resilience and reduce negative outcomes associated with ACEs. Claro et al. (2016) shows that promoting a growth mindset in high risk individuals can lead to positive outcomes. This systematic review only discusses a few factors that may promote resilience. Future research is still needed to further comprehend all underlying components of resilience.

Implications

The information attained from this systematic review has important implications for nurses and other health care professionals. Early substance use prevention strategies could use high ACE scores as a marker for youth at risk for substance use. Including an ACE measurement

tool in assessments of patients seeking treatment for substance use may provide a way to identify patients most at risk for serious, negative outcomes (Stein et al., 2017). Brown and Shillington (2017) also advocated for the implementation of more thorough assessment of ACEs among individuals in the child welfare system in addition to assessing their support networks as it has been shown that lack of supportive, adult relationships can increase risk for negative outcomes. In the study conducted by Chandler et al. (2018), a trauma-informed approach was utilized during patient interviews. Trauma-informed care requires a nonjudgmental approach throughout the interview which promotes therapeutic communication and validates the patient. Chandler et al. (2018) noted during interviews using this approach, participants were initially guarded but, as the interview progressed, they became calm, which lends to the effectiveness of the protocol. Interviewees responded positively to compassion demonstrated by the interviewer. Those in healthcare and social services should be mindful of this trauma-informed care approach while assessing their patients. The development of trauma-informed services is ongoing and attempts to better support those affected by ACEs (National Health Service Education for Scotland, 2017; Leitch, 2017). In addition, once individuals who are at risk are identified, interventions can be implemented to promote resilience. This systematic review has identified social support, positive coping strategies, growth mindset, and mindfulness as elements of resilience that can be nurtured in those who have experienced ACEs.

Limitations

Limitations of this systematic review involve the design of the studies included. Many studies were cross-sectional in nature. Cross-sectional studies which collect data only at one

point in time do not allow for the assessment of trends throughout the lifespan. Cross-sectional studies may also include other variables that may confound results. Also, the retrospective, self-reporting of ACEs leaves room for recall bias and over or under reporting, and these reports often could not be verified. Some articles had an in-person component to the interview which could have led to a social desirability bias. No cause and effect relationship can be drawn from these data, only correlation relationships.

Chapter 5

Conclusion

A clear relationship exists between adverse childhood experiences and the risk for substance use development. Some adverse childhood experiences are associated with higher risk for substance use including physical and sexual abuse, witnessing domestic violence, and presence of a household member with a mental illness or substance use issue. Cumulative ACEs are shown to have a strong, positive correlation to substance use with an increase in ACEs associated with higher substance use outcomes. Individuals who experience higher numbers of ACEs are at the greatest risk for substance use. Negative outcomes of ACEs that predispose individuals to substance use include impulsivity, changes in the HPA axis and physiological stress response, and mental health diagnoses. There is disagreement in the current literature regarding the role of nonmodifiable variables including gender, age, race. Nonmodifiable variables including socioeconomic status and family history are associated with substance use. Modifiable variables including social support, coping strategies, growth mindset, mindfulness, and resilience lessen the impact of ACEs and additional research should be conducted on effective promotion. Implementation of ACE screening tools could help identify youth who have experienced high adversity and who are at risk for substance use. Identifying these individuals and connecting them with appropriate resources can help to improve their outcomes.

Appendix A

Databases and Search Terms Used

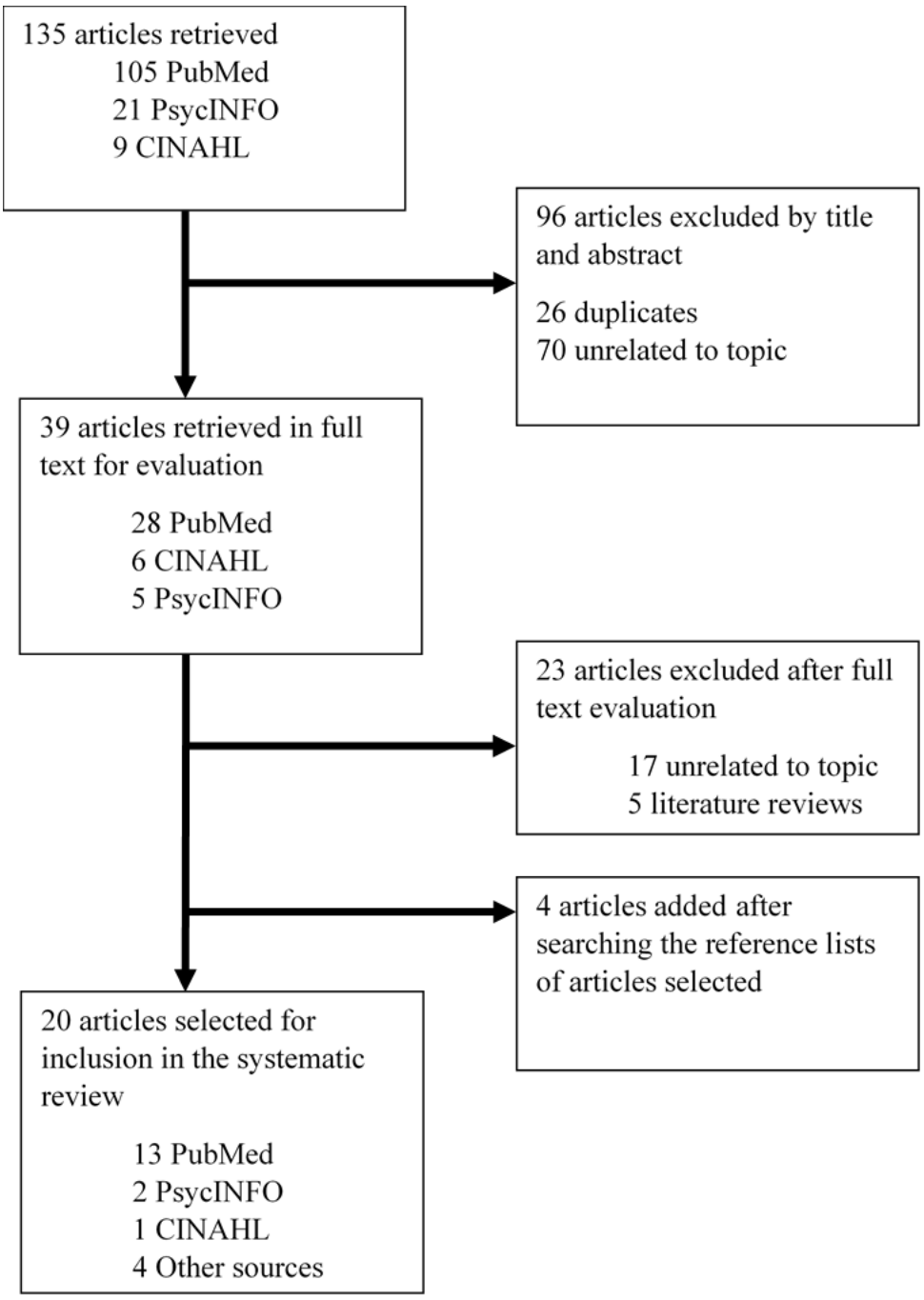
Table 1. Databases and Search Terms Used

Databases Searched	Search Terms
PubMed	(Adverse childhood experiences OR childhood trauma OR traumatic childhood events) AND (substance use disorder OR adult substance abuse OR adult substance use) (Adverse childhood experiences OR Childhood trauma OR traumatic childhood events) AND (modifiable variables OR nonmodifiable variables OR protective factors OR risk factors)
CINHAL	(Adverse childhood experiences OR childhood trauma OR traumatic childhood events) AND (substance use disorder OR adult substance abuse OR adult substance use) (Adverse childhood experiences OR Childhood trauma OR traumatic childhood events) AND (modifiable variables OR nonmodifiable variables OR protective factors OR risk factors)
psycINFO	(Adverse childhood experiences OR childhood trauma OR traumatic childhood events) AND (substance use disorder OR adult substance abuse OR adult substance use) (Adverse childhood experiences OR Childhood trauma OR traumatic childhood events) AND (modifiable variables OR nonmodifiable variables OR protective factors OR risk factors)

Appendix B

Selection of Articles for Inclusion in the Review

Figure 1. PRISMA Flow Diagram



Appendix C

Characteristics of Articles in the Systematic Review

Table 2. Characteristics of Articles in the Systematic Review

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Hughes, K., Bellis, M. A., Sethi, D., Andrew, R., Yon, Y., Wood, S., ... & Makaruk, K. (2019). Adverse childhood experiences, childhood relationships and associated substance use and mental health in young Europeans. *European Journal of Public Health*, *29*(4), 741-747. Hughes et al., 2019	To explore associations between number of ACEs individuals suffered (as an indicator of increasing levels of adversity) and outcomes related to substance use and mental health, and to examine the potentially protective effects of supportive childhood relationships on these associations.	n = 14,661 Respondents of the Family Health History questionnaire aged 18-25 from Czech Republic, Lithuania, Republic of Moldova, Montenegro, Poland, Romania, the Russian Federation, Serbia, Ukraine and the former Yugoslav Republic of Macedonia.	Cross-sectional study	Family Health History questionnaire	The more ACEs reported, the more likely participants adopted substance use (cigarettes, alcohol and drugs) and developed poor mental health. Findings indicate benefits from supportive childhood relationships, but data also show the more ACEs reported, the less likely participants are to have such relationships	*Strengths* Large, representative sample size *Limitations* Cross-sectional nature cannot identify causal relationships

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Kim, Y., Kim, K., Chartier, K. G., Wike, T. L., & McDonald, S. E. (2019). Adverse childhood experience patterns, major depressive disorder, and substance use disorder in older adults. *Aging and Mental health*, 1-8. Kim et al., 2019	To investigate distinct patterns of adverse childhood experiences in a representative sample of US older adults, and how the ACE patterns relate to major depression and substance use disorder (SUD).	n = 11,386 Original study participants randomly selected from non-institutionalized population from 2012-2013 aged 18+. This study included participants aged 55+.	Cross-sectional study Latent class analyses	National Epidemiologic Survey on Alcohol and Related Conditions III	High adversity, child abuse, and parental substance abuse classes more likely to have past-year SUD than low ACE class. Having a major depressive disorder was positively associated with SUD, especially in high adversity and child abuse classes.	*Strengths* Large, representative sample size, Control for other variables. Showed partial mediating role of MDD in relationship between ACEs and SUD. *Limitations* Cross-sectional data cannot identify causal relationships. Retrospective reporting.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Sheffler, J. L., Piazza, J. R., Quinn, J. M., Sachs-Ericsson, N. J., & Stanley, I. H. (2019). Adverse childhood experiences and coping strategies: identifying pathways to resiliency in adulthood. *Anxiety, Stress, & Coping*, *32*(5), 594-609. Sheffler et al., 2019	To examine whether coping strategies mediate the link between adverse childhood experiences (ACEs) and adult psychiatric and physical health outcomes.	wave I (N = 7108), wave II (N = 4963), wave III (N = 3294) of MIDUS Wave I: Aged 25–74 years of age, recruited through random digit dialing. 10 years later, 4,963 participants from the original sample completed Wave II. Wave III MIDUS data was collected between 2013 and 2014 from 3,294 of the original participants	Longitudinal study	Dichotomous items derived from Wave I of MIDUS assessed retrospective accounts of childhood adversity COPE inventory Composite International Diagnostic Interview Short Form	Coping styles may be one important and modifiable pathway between early adverse experiences and the development of later life health and psychiatric problems. AEF coping contributed to the pathway between ACEs and physical health problems in adulthood: ACEs were associated with greater AEF coping and, AEF coping was associated with more health problems PF coping did not act as a significant pathway between ACEs and later health.	*Strengths* Large sample size. Longitudinal study design. Valid and reliable instruments. Clearly defined variables and purpose *Limitations* Sample mostly Caucasian Retrospective report of ACEs

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Brett, E. I., Espeleta, H. C., Lopez, S. V., Leavens, E. L., & Leffingwell, T. R. (2018). Mindfulness as a mediator of the association between adverse childhood experiences and alcohol use and consequences. *Addictive Behaviors, 84*, 92-98. Brett et al., 2018	To examine the mediating role of mindfulness in the relation between early adversity and current alcohol use and consequences.	n =385 Young adults who reported past 30-day alcohol consumption and were at least 18 years old. Participants recruited from a large, public, Midwestern university.	Cross-sectional study	Daily Drinking Questionnaire Brief Young Adult Alcohol Consequences Questionnaire Five Facet Mindfulness Questionnaire Adverse Childhood Experiences Questionnaire - Short Form	Mindfulness mediated the relations between early adversity and alcohol use and consequences	*Strengths* One of few studies to assess a mediator in the relationship between ACEs and alcohol use. Reliable and valid instruments. *Limitations* Young, mostly female sample limiting generalizability. Limited number of ACEs assessed using short form. Sample consisted of college students, results may differ in a more at-risk population

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Chandler, G. E., Kalmakis, K. A., & Murtha, T. (2018). Screening adults with substance use disorder for adverse childhood experiences. *Journal of Addictions Nursing*, *29*(3), 172-178. Chandler et al., 2018	To assess incidence of ACEs and efficacy and feasibility of trauma-informed screening for ACEs among individuals in a substance use disorder recovery program	n = 30 Clients of an SUD treatment program in Baltimore, Maryland, were recruited for the study. Individuals over the age of 21 years with a diagnosis of SUD	Cross-sectional study	Positive and Adverse Childhood Events Survey	Increased number of ACEs in the population with SUD compared with the general population.	*Strengths* Showed the feasibility of conducting an ACE screening intervention in an SUD treatment center and the prevalence of ACEs among clients with SUDs *Limitations* Limited generalizability due to small sample size and participants recruited from single SUD treatment program in rural area

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Forster, M., Grigsby, T. J., Rogers, C. J., & Benjamin, S. M. (2018). The relationship between family-based adverse childhood experiences and substance use behaviors among a diverse sample of college students. *Addictive Behaviors*, *76*, 298-304. Forster et al., 2018	To describe extent of ACE exposure among college sample and number of students with ACE history engaged in substance use. To examine the association between individual family-based ACE and substance use. To test a dose-response relationship between accumulated ACE and substance use.	n = 2953 Participants from a large, diverse California State University campus	Cross-sectional study	American College Health Association's National College Health Assessment II plus six additional questions regarding ACEs	Each individual ACE – with the exception of verbal and physical abuse – was positively associated with all substance use behaviors.	*Strengths* Large sample size. *Limitations* Cannot generalize results. Cannot identify causal relationship. Cannot avoid recall bias.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Kiburi, S. K., Molebatsi, K., Obondo, A., & Kuria, M. W. (2018). Adverse childhood experiences among patients with substance use disorders at a referral psychiatric hospital in Kenya. *BioMed Central Psychiatry*, *18*(1), 197. Kiburi et al., 2018	To determine the prevalence of adverse childhood experiences and their association with substance use among patients with substance use disorders.	n = 134 Participants recruited from Mathari National Teaching and Referral Hospital, the only referral psychiatric hospital in Kenya. 18 years or older, mentally stable, able to give consent, being treated or managed for SUD.	Cross-sectional study	Adverse childhood experiences international questionnaire Alcohol, smoking and substance involvement screening test	Household violence predicted lifetime alcohol use Emotional abuse predicted lifetime tobacco/sedative use Household member with a mental illness increased risk of tobacco use by 5 times Physical abuse predicted cannabis use Report of 5 or more ACEs increased risk of sedative use by 15 times	*Strengths* Reliable and well-validated instruments. Measured 13 facets of ACEs. Few other studies done in developing countries *Limitations* Over-reporting or under-reporting cannot be totally ruled out as a result of the use of self-report questionnaires. Data collected was retrospective which may have led to recall bias. Convenience sampling may result in sampling error and limits the generalizability of the findings beyond the sample.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Lovallo, W. R., Acheson, A., Vincent, A. S., Sorocco, K. H., & Cohoon, A. J. (2018). Early life adversity diminishes the cortisol response to opioid blockade in women: Studies from the Family Health Patterns project. *Public Library of Science One*, *13*(10). Lovallo et al., 2018	To explore how blunted stress reactivity may occur in individuals following ACEs which may increase risk for SUD	n = 76 Healthy, nonpregnant females aged 18-30, with no history of any Axis I disorder	Double-blind crossover study	C-DIS-IV	Early life adversity may lead to blunted stress axis reactivity which is associated with altered emotional reactivity, impulsive behaviors, and risk for substance use disorders. Early experiences modify responses to the environment in adulthood, potentially influencing health behaviors.	*Strengths* Highly rigorous study design. Provides a possible explanation for increased SUD tendencies in the ACE population. Other variables affecting stress reactivity controlled for. *Limitations* Small, all female sample size limiting generalizability

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Mergler, M., Driessen, M., Havemann-Reinecke, U., Wedekind, D., Lüdecke, C., Ohlmeier, M., ... & Renner, W. (2018). Differential relationships of PTSD and childhood trauma with the course of substance use disorders. *Journal of Substance Abuse Treatment*, *93*, 57-63. Mergler et al., 2018	Three subgroups of participants with substance use disorder: those with history of childhood trauma and PTSD, those with just childhood trauma, and those with neither childhood trauma or PTSD. These three groups were analyzed to uncover patterns of the course and severity of SUD.	n = 438 Participants recruited from 14 addiction treatment centers in Germany Substance dependence 15-60 years old	Cross-sectional study	International Diagnostic Checklist Posttraumatic Diagnostic Scale Childhood Trauma Questionnaire European Addiction Severity Index	CT-PTSD had more anxiety, depression, suicidal thoughts and suicide attempts than the No trauma group. The CT-PTSD group reported more severe addiction compared to the No trauma group. CT-only group reported more anxiety, depression, suicidal tendencies than the No trauma group.	*Strengths* Medium sample size. Comparison of three subgroups of participants with SUD. Valid and reliable instruments. *Limitations* 40% female sample may limit generalizability. Limiteded control of other variables that may influence development of SUD.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Oshri, A., Kogan, S. M., Kwon, J. A., Wickrama, K. A. S., Vanderbroek, L., Palmer, A. A., & Mackillop, J. (2018). Impulsivity as a mechanism linking child abuse and neglect with substance use in adolescence and adulthood. *Development and Psychopathology*, *30*(2), 417-435. Oshri et al., 2018	To investigate the role of impulsivity in linking child abuse and neglect with adult substance use.	n = 9,421	Longitudinal study	Adverse Childhood Experiences questionnaire Alcohol Use Disorders Identification Test Monetary-Choice Questionnaire Impulsive Behavior Scale	Impulsivity, in part, explained the effects of child abuse and neglect on the frequency of substance use in young adulthood.	*Strengths* Large, representative sample size. Identification of a possible explanation for ACEs effect on SUD. Longitudinal study. *Limitations* Retrospective reporting of ACEs leaves data vulnerable to recall bias

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Shin, S. H., McDonald, S. E., & Conley, D. (2018). Patterns of adverse childhood experiences and substance use among young adults: A latent class analysis. *Addictive Behaviors, 78*, 187-192. Shin et al., 2018	To investigate how different patterns of ACEs influence substance use in young adulthood	n = 336 Adults aged 18-25	Cross-sectional study Latent class analyses	Childhood Trauma Questionnaire Verbal Aggression Scale Rutgers Alcohol Problem Index	4 classes of ACE exposure emerged: 1) Low, 2) Household dysfunction/ community violence, 3) Emotional ACEs, and 4) High/multiple ACEs. Classes 2, 3, and 4 had higher rates of alcohol use compared to class 1. Class 4 was most likely to report alcohol related problems and psychological symptoms.	*Strengths* Use of a community sample. Multiple categories of ACE types Inclusion of many controls. *Limitations* Cross-sectional nature of the study cannot identify cause. Potential recall and social desirability bias.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Brown, S. M., & Shillington, A. M. (2017). Childhood adversity and the risk of substance use and delinquency: The role of protective adult relationships. *Child Abuse and Neglect, 63,* 211-221. Brown & Shillington, 2017	To examine whether protective adult relationships moderated the link between cumulative ACEs and substance use and delinquency	n = 1,054 Participants were aged 11–17, from the National Survey of Child and Adolescent Well-Being II	Longitudinal study	National Survey of Child and Adolescent Well-being Longitudinal Studies of Child Abuse and Neglect Denver Youth Survey Six-item CRAFFT	ACEs are associated with increased engagement in substance use and delinquent acts. Protective adult relationships alone did not significantly affect substance use, but moderated the relationship between ACEs and youths' use of drugs and alcohol. For youth who reported fewer protective adult relationships, the association between exposure to ACEs and increased substance use was strongest.	*Strengths* Large, representative sample size. Controlled for demographic variables. Reliable and valid instruments. *Limitations* Self-reporting nature of study could lead to under- or over-reporting of behaviors

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Burnette, C. E., Roh, S., Lee, K. H., Lee, Y. S., Newland, L. A., & Jun, J. S. (2017). A comparison of risk and protective factors related to depressive symptoms among American Indian and Caucasian older adults. *Health & Social Work, 42*(1), e15-e23. Burnette et al., 2017	ACEs and social support are well-documented risk and protective factors for depression in the general population, little is known about AI/AN populations, especially older adults. The purpose of this study was to examine factors related to depression among a sample of AI older adults in the Midwest compared to Caucasians.	n = 479 AI/AN and Caucasian respondents over the age of 50	Cross-sectional study	Geriatric Depression Scale–Short Form The ACE questionnaire Multidimensional Scale of Perceived Social Support	AI/AN population experienced more ACEs on average than Caucasian population. Childhood abuse and household dysfunction correlated to depressive symptoms in AI/IN population. High levels of adult social support was a buffer for depressive symptoms in AI/IN and Caucasian population	*Strengths* Presence of comparison group. Medium sample size. Clearly defined variables and purpose *Limitations* Cross-sectional nature does not allow for causal inferences Retrospective reporting of ACEs Sample not representative

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Choi, N. G., DiNitto, D. M., Marti, C. N., & Choi, B. Y. (2017). Association of adverse childhood experiences with lifetime mental and substance use disorders among men and women aged 50+ years. *International Psychogeriatrics*, *29*(3), 359-372. Choi et al., 2017	To examine the association between ten types of adverse childhood experiences and lifetime mental and substance use disorders among those aged 50+.	n = 14,738 Data came from the 2012–2013 U.S. National Epidemiologic Survey on Alcohol and Related Conditions, participated aged 50+ were included	Cross-sectional study	Alcohol Use Disorder and Associated Disabilities Interview Schedule National Epidemiologic Survey on Alcohol and Related Conditions	Psychological abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect were associated with MDD, anxiety disorder, and PTSD. Physical abuse, sexual abuse, and parental/other adult's substance abuse were significantly associated with increased odds of lifetime substance use disorders (alcohol, drug, and nicotine)	*Strengths* Large, representative sample. *Limitations* Relationships found in the study represent correlations, not causation. Self-reporting of past events may be subject to recall and self-disclosure bias.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Moses, J. O., & Villodas, M. T. (2017). The potential protective role of peer relationships on school engagement in at-risk adolescents. *Journal of Youth and Adolescence, 46*(11), 2255-2272. Moses & Villodas, 2017	To examine the potential protective role of positive peer relationships in the association between adverse childhood experiences and school engagement among at-risk adolescents	n = 831 Diverse adolescents at-risk for family violence and their caregivers	Longitudinal study	Adaptation of the Adverse Childhood Experiences Questionnaire Conflict Tactics Scales-Parent-Child Networks of Relationship Inventory Wide Range Achievement Test	Adverse childhood experiences were associated with poorer outcomes in all domains. High peer intimacy mitigated the negative impact of ACEs on prosocial activity engagement. Peer companionship was protective against the negative effects of ACEs on perceptions of school importance. Low peer conflict was protective against the association between ACEs and school dropout contemplation.	*Strengths* Medium, diverse sample Reliable and valid instruments Clearly defined variables and purpose *Limitations* Subjective reporting of peer relationships and school performance Retrospective reporting of ACEs

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Stein, M. D., Conti, M. T., Kenney, S., Anderson, B. J., Flori, J. N., Risi, M. M., & Bailey, G. L. (2017). Adverse childhood experience effects on opioid use initiation, injection drug use, and overdose among persons with opioid use disorder. *Drug and Alcohol Dependence*, *179*, 325-329. Stein et al., 2017	To examine the relationship between adverse childhood experiences and three landmarks of opioid use: age of opioid initiation, injection drug use, and lifetime overdose.	n = 457 Participants were consecutive persons seeking inpatient opioid detoxification at Stanley Street Treatment and Resources, Inc. (SSTAR) in Fall River, Massachusetts. 18 years or older and English-speaking	Cross-sectional survey	Ten-item ACE questionnaire	ACE score was inversely associated with age of opioid use initiation and positively associated with likelihood of recent injection drug use and lifetime overdose.	*Strengths* Demonstration of a significant additive negative impact of experiencing multiple adverse events during childhood. *Limitations* Fallibility of participants' retrospective recall of adverse experiences in childhood. Possible response bias and underreported ACE history and drug use behaviors related to in-person interviews. Small sample size unrepresentative of sample population.

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Claro, S., Paunesku, D., & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences*, *113*(31), 8664-8668. Claro et al., 2016	To answer: Is the relationship between mindset and achievement is reliable and observable across an entire nation (Chile)? Is the relationship meaningful when measured against socioeconomic disparities? Does economic disadvantage reinforce a fixed mindset? Does a fixed mindset set back even further those who are already economically disadvantaged?	n = 168,203 75% of all 10th graders from 98% of Chile's public schools	Cross-sectional study	Chilean System for Measurement of Educational Quality "Theory of Intelligence" Scale	At every socioeconomic level, those who hold more of a growth mindset consistently outperform those who do not. In other words, for any two students with equal characteristics, the one with a growth mindset is more likely to enjoy higher academic achievement. The lowest-income students were twice as likely as the highest income students to report a fixed mindset, their mindset was an even stronger predictor of success.	*Strengths* Large, representative sample Clearly defined variables and purpose Reliable and valid instruments *Limitations* Cross-sectional design

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Fuller-Thomson, E., Roane, J. L., & Brennenstuhl, S. (2016). Three types of adverse childhood experiences, and alcohol and drug dependence among adults: an investigation using population-based data. *Substance Use & Misuse, 51*(11), 1451-1461. Fuller-Thomson et al., 2016	To estimate associations between three types of ACEs (sexual abuse, physical abuse, and exposure to parental domestic violence), when mutually adjusted, and two substance dependence outcomes (alcohol and drug dependence), while considering the potential moderating role of gender and the effects of a range of potential explanatory factors.	n = 21,554 Respondents of the Canadian Community Health Survey-Mental Health (CCHS-MH) aged 18 years or older individually selected from a household in a selected geographical area.	Cross-sectional survey	Childhood Experiences of Violence Questionnaire-Short Form World Health Organization-Composite International Diagnostic Interview	Physical abuse, sexual abuse, and witnessing domestic violence are all independently associated with higher instances of drug and alcohol abuse. History of mental illness most largely attenuates the relationship between ACEs and drug/alcohol dependence	*Strengths* Reliable and well-validated measures of two types of substance dependence Large population-based sample with a decent response rate Control for five categories of potential explanatory factors *Limitations* The retrospective self-reporting of ACEs could not be verified. It is possible that those who are dependent on substances may be more likely to report a history of childhood adversity as a way of accounting for their current circumstances

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Jääskeläinen, M., Holmila, M., Notkola, I. L., & Raitasalo, K. (2016). Mental disorders and harmful substance use in children of substance abusing parents: A longitudinal register-based study on a complete birth cohort born in 1991. *Drug and Alcohol Review*, *35*(6), 728-740. Jääskeläinen et al., 2016	To examine if parental substance abuse is associated with children's mental disorders in mid-childhood (7–12 years) and mental disorders and own substance use in adolescence (13–17years), and whether children are affected differently by a mother or father's substance abuse.	n = 63,639 Complete birth cohort of children born in Finland in 1991 and their biological parents.	Longitudinal cohort study	Bivariate and multivariate logistic regression models	Maternal, paternal and both parents' substance abuse were significant predictors of mental disorders and harmful substance use in children aged 13–17 years. Maternal substance abuse had stronger effect on harmful substance use in adolescent children than paternal.	*Strengths* Controlled for other ACEs, parental education, and child's gender. Measurements for substance use, mental disorders, and abuse were obtained from entries in administrative registers and are based on diagnoses and definitions made by medical doctors and other professionals. Longitudinal complete cohort study *Limitations* Measurements were taken from administrative registers so it is possible that substance abuse is under represented because some do not seek treatment

CITATION	PURPOSE	SAMPLE	DESIGN	INSTRUMENTS	KEY FINDINGS	STRENGTHS LIMITATIONS
Wu, N. S., Schairer, L. C., Dellor, E., & Grella, C. (2010). Childhood trauma and health outcomes in adults with comorbid substance abuse and mental health disorders. *Addictive Behaviors*, *35*(1), 68-71. Wu et al., 2010	To describe the prevalence of childhood traumatic events (CTEs) among a sample of adults with substance use disorders and mental health problems and examine the association between cumulative CTEs and adult health problems.	n = 402 Participants selected from drug abuse treatments programs in Los Angeles County. Participants seeking or receiving mental health services. 18 years or older.	Cross-sectional study	Life Stressor Checklist — Revised Structured Clinical Interview for the DSM-IV Axis I Disorders — Patient Edition Brief Symptom Inventory Trauma Symptom Checklist-40 Lehman Quality of Life Interview	CTEs are two to nine times higher in populations with substance use and mental health disorders when compared to populations in a primary health care setting. 95% of individuals being treated for substance use disorders and mental health disorders report at least one CTE compared to 64% in a primary care setting.	*Strengths* Reliable and well-validated instruments. Medium sample size. Compared results with a control group (primary care setting). *Limitations* Unable to generalize findings to include adults treated in outpatient programs or who are not seeking treatment. Retrospective self-report data on exposure to CTEs and adverse health outcomes are subject to limitations from recall bias or lack of self-disclosure.

References

Afifi, T. O., Enns, M. W., Cox, B. J., Asmundson, G. J., Stein, M. B., & Sareen, J. (2008). Population attributable fractions of psychiatric disorders and suicide ideation and attempts associated with adverse childhood experiences. *American Journal of Public Health, 98*(5), 946-952

Anda, R. F., Croft, J. B., Felitti, V. J., Nordenberg, D., Giles, W. H., Williamson, D. F., & Giovino, G. A. (1999). Adverse childhood experiences and smoking during adolescence and adulthood. *Journal of the American Medical Association, 282*(17), 1652-1658.

Baglivio, M. T., Wolff, K. T., Piquero, A. R., & Epps, N. (2015). The relationship between adverse childhood experiences (ACE) and juvenile offending trajectories in a juvenile offender sample. *Journal of Criminal Justice, 43*(3), 229-241.

Brett, E. I., Espeleta, H. C., Lopez, S. V., Leavens, E. L., & Leffingwell, T. R. (2018). Mindfulness as a mediator of the association between adverse childhood experiences and alcohol use and consequences. *Addictive Behaviors*, *84*, 92-98.

Brown, S. M., & Shillington, A. M. (2017). Childhood adversity and the risk of substance use and delinquency: The role of protective adult relationships. *Child Abuse and Neglect*, *63*, 211-221.

Centers for Disease Control and Prevention. (2019). *About the CDC-Kaiser ACE study.* Retrieved from https://www.cdc.gov/violenceprevention/childabuseandneglect/acestudy/about.html

Chandler, G. E., Kalmakis, K. A., & Murtha, T. (2018). Screening adults with substance use disorder for adverse childhood experiences. *Journal of Addictions Nursing*, *29*(3), 172-178.

Chartier, K. G., Hesselbrock, M. N., & Hesselbrock, V. M. (2010). Development and vulnerability factors in adolescent alcohol use. *Child and Adolescent Psychiatric Clinics*, *19*(3), 493-504.

Choi, N. G., DiNitto, D. M., Marti, C. N., & Choi, B. Y. (2017). Association of adverse childhood experiences with lifetime mental and substance use disorders among men and women aged 50+ years. *International Psychogeriatrics*, *29*(3), 359-372.

Cicchetti, D., Rogosch, F. A., & Oshri, A. (2011). Interactive effects of corticotropin releasing hormone receptor 1, serotonin transporter linked polymorphic region, and child maltreatment on diurnal cortisol regulation and internalizing symptomatology. *Development and Psychopathology*, *23*(4), 1125-1138.

Claro, S., Paunesku, D., & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences*, *113*(31), 8664-8668.

Compton, W. M., Thomas, Y. F., Stinson, F. S., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States: results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry*, *64*(5), 566-576.

Dishion, T. J., Andrews, D. W., & Crosby, L. (1995). Antisocial boys and their friends in early adolescence: Relationship characteristics, quality, and interactional process. *Child Development, 66* (1), 139–151. doi:10.1111/j.1467-8624.1995.tb00861.x.

Ellis, B. J., Bates, J. E., Dodge, K. A., Fergusson, D. M., John Horwood, L., Pettit, G. S., & Woodward, L. (2003). Does father absence place daughters at special risk for early sexual activity and teenage pregnancy? *Child Development*, *74*(3), 801-821.

Forster, M., Grigsby, T. J., Rogers, C. J., & Benjamin, S. M. (2018). The relationship between family-based adverse childhood experiences and substance use behaviors among a diverse sample of college students. *Addictive Behaviors*, *76*, 298-304.

Fuller-Thomson, E., Roane, J. L., & Brennenstuhl, S. (2016). Three types of adverse childhood experiences, and alcohol and drug dependence among adults: an investigation using population-based data. *Substance Use and Misuse*, *51*(11), 1451-1461.

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2008). Exposure to childhood sexual and physical abuse and adjustment in early adulthood. *Child Abuse and Neglect*, *32*(6), 607-619.

Goodman, A. (2010). Substance use and common child mental health problems: examining longitudinal associations in a British sample. *Addiction*, *105*(8), 1484-1496.

Gough, D. (2007). Weight of evidence: a framework for the appraisal of the quality and relevance of evidence. Research papers in education, 22(2), 213-228.

Gureje, O., Nortje, G., Makanjuola, V., Oladeji, B. D., Seedat, S., & Jenkins, R. (2015). The role of global traditional and complementary systems of medicine in the treatment of mental health disorders. *The Lancet Psychiatry*, *2*(2), 168-177.

Halpern, S. C., Schuch, F. B., Scherer, J. N., Sordi, A. O., Pachado, M., Dalbosco, C., ... & Von Diemen, L. (2018). Child maltreatment and illicit substance abuse: a systematic review and meta-analysis of longitudinal studies. *Child Abuse Review*, *27*(5), 344-360.

Hasin, D. S., Stinson, F. S., Ogburn, E., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, *64*(7), 830-842.

Hildyard, K. L., & Wolfe, D. A. (2002). Child neglect: developmental issues and outcomes. *Child Abuse & Neglect*, *26*(6-7), 679-695.

Hosking, J., & Winstanley, C. A. (2011). Impulsivity as a mediating mechanism between early-life adversity and addiction: Theoretical comment on Lovic et al. (2011).

Hughes, K., Bellis, M. A., Sethi, D., Andrew, R., Yon, Y., Wood, S., ... & Makaruk, K. (2019). Adverse childhood experiences, childhood relationships and associated substance use and mental health in young Europeans. *European Journal of Public Health*, *29*(4), 741-747.

Jääskeläinen, M., Holmila, M., Notkola, I. L., & Raitasalo, K. (2016). Mental disorders and harmful substance use in children of substance abusing parents: A longitudinal register-based study on a complete birth cohort born in 1991. *Drug and Alcohol Review*, *35*(6), 728-740.

Kiburi, S. K., Molebatsi, K., Obondo, A., & Kuria, M. W. (2018). Adverse childhood experiences among patients with substance use disorders at a referral psychiatric hospital in Kenya. *BioMed Central Psychiatry*, *18*(1), 197.

Kim, Y., Kim, K., Chartier, K. G., Wike, T. L., & McDonald, S. E. (2019). Adverse childhood experience patterns, major depressive disorder, and substance use disorder in older adults. *Aging and Mental health*, 1-8.

Leitch, L. (2017). Action steps using ACEs and trauma-informed care: a resilience model. *Health and Justice*, *5*(1), 5.

Li, M., D'arcy, C., & Meng, X. (2016). Maltreatment in childhood substantially increases the risk of adult depression and anxiety in prospective cohort studies: systematic review, meta-analysis, and proportional attributable fractions. *Psychological Medicine*, *46*(4), 717-730.

Lovallo, W. R., Acheson, A., Vincent, A. S., Sorocco, K. H., & Cohoon, A. J. (2018). Early life adversity diminishes the cortisol response to opioid blockade in women: Studies from the Family Health Patterns project. *Public Library of Science One*, *13*(10).

Lovallo, W. R. (2006). Cortisol secretion patterns in addiction and addiction risk. *International Journal of Psychophysiology, 59*(3), 195-202.

Marcus, R. F. (1996). The friendships of delinquents. *Adolescence, 31* (121), 145–158.

McLanahan, S., Tach, L., & Schneider, D. (2013). The causal effects of father absence. *Annual Review of Sociology*, *39*, 399-427.

Mergler, M., Driessen, M., Havemann-Reinecke, U., Wedekind, D., Lüdecke, C., Ohlmeier, M., ... & Renner, W. (2018). Differential relationships of PTSD and childhood trauma with the course of substance use disorders. *Journal of Substance Abuse Treatment*, *93*, 57-63.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). PRISMA Group: Methods of systematic reviews and meta-analysis: preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Journal of Clinical Epidemioogyl*, *62*, 1006-1012.

National Institute on Drug Abuse. (2017a). *Health consequences of drug misuse*. Retrieved from https://www.drugabuse.gov/related-topics/health-consequences-drug-misuse

National Institute on Drug Abuse. (2017b). *Trends and statistics*. Retrieved from https://www.drugabuse.gov/related-topics/trends-statistics

National Health Service Education for Scotland. (2017) *Transforming Psychological Trauma: A Knowledge and Skills Framework for the Scottish Workforce.*

Oladeji, B. D., Makanjuola, V. A., & Gureje, O. (2010). Family-related adverse childhood experiences as risk factors for psychiatric disorders in Nigeria. *The British Journal of Psychiatry*, *196*(3), 186-191.

Oshri, A., Kogan, S. M., Kwon, J. A., Wickrama, K. A. S., Vanderbroek, L., Palmer, A. A., & Mackillop, J. (2018). Impulsivity as a mechanism linking child abuse and neglect with substance use in adolescence and adulthood. *Development and Psychopathology*, *30*(2), 417-435.

Rhodes, J. E. (2005). A model of youth mentoring. *Handbook of Youth Mentoring*, 30-43.

Roberts, A. L., Gilman, S. E., Breslau, J., Breslau, N., & Koenen, K. C. (2011). Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. *Psychological Medicine*, *41*(1), 71-83.

Shin, S. H., McDonald, S. E., & Conley, D. (2018). Patterns of adverse childhood experiences and substance use among young adults: A latent class analysis. *Addictive Behaviors, 78*, 187-192.

Smith, V. C., & Wilson, C. R. (2016). Families affected by parental substance use. *Pediatrics*, *138*(2), e20161575.

Stein, M. D., Conti, M. T., Kenney, S., Anderson, B. J., Flori, J. N., Risi, M. M., & Bailey, G. L. (2017). Adverse childhood experience effects on opioid use initiation, injection drug use, and overdose among persons with opioid use disorder. *Drug and Alcohol Dependence*, *179*, 325-329.

Tate, S. R., Norman, S. B., McQuaid, J. R., & Brown, S. A. (2007). Health problems of substance-dependent veterans with and those without trauma history. *Journal of Substance Abuse Treatment*, *33*(1), 25-32.

Wadsworth, M. E. (2015). Development of maladaptive coping: A functional adaptation to chronic, uncontrollable stress. *Child Development Perspectives*, *9*(2), 96-100.

Weed, D. L. (2005). Weight of evidence: a review of concept and methods. *Risk Analysis: An International Journal*, *25*(6), 1545-1557.

Wu, N. S., Schairer, L. C., Dellor, E., & Grella, C. (2010). Childhood trauma and health outcomes in adults with comorbid substance abuse and mental health disorders. *Addictive Behaviors*, *35*(1), 68-71.

Yoshioka, M. R., & Dang, Q. (2000). Asian family violence report: A study of the Cambodian, Chinese, Korean, South Asian, and Vietnamese communities in Massachusetts. Boston: Asian Task Force Against Domestic Violence, Inc.

Zhang, H., Behrman, J. R., Fan, C. S., Wei, X., & Zhang, J. (2014). Does parental absence reduce cognitive achievements? Evidence from rural China. *Journal of Development Economics*, *111*, 181-195.

ACADEMIC VITA

Kayleen Boeckenhauer
Boeckenhauerkatie@gmail.com

Education:

Bachelor of Science in Nursing
The Schreyer Honors College
The Pennsylvania State University
Thesis Title: The Relationship Between Adverse Childhood Experiences and the Development of Substance Use
Thesis Supervisor: Dr. Charisse Nixon

Experience:

Student Nurse Summer Externship
Behavioral Health Unit
Saint Vincent Hospital
May 2019 - August 2019

Personal Care Assistant
Behavioral Health Unit
Saint Vincent Hospital
August 2019 - current

Medical Assistant
MedExpress Urgent Care
March 2016 - current

Activities:

Behrend Honors Program
Penn State Behrend
Fall 2016 - Spring 2018

Youth Mentor
C.O.R.E at Penn State Behrend
Spring 2018, Fall 2019

Member
Student Nurses' Association of Pennsylvania
September 2017 - May 2020